

Introduction

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The great Paraná basin (2,600,000 km²) covers a large portion of the Neotropical Realm, extending from the Andes to the Atlantic coast and connecting the central regions of South America along 2,200 km in a north–south direction. Most of the basin is under subtropical climates, which range from desertic in the west to humid in the east.

The Middle Paraná is a broad, complex floodplain extending 600 km in the heart of the interior lowlands of the continent. This system of river channels, shallow lakes, islands, and wetlands remains unoccupied by man and basically unaltered. From a systemic point of view, this area can be considered to be the most important link and collector of the fluvial chain that conveys huge volumes of nutrients, sediments, and salts from the continent to the South Atlantic Ocean. The influence of the Paraná upon the Atlantic is very important. It has been calculated that a sediment deposit 400 m thick and 1 million km² in area accumulated in the platform and nearby oceanic bottom over the last 2 million years, with a similar amount of dissolved salts contributed by the river to the ocean.

This book details the recent advances in the knowledge of the most important segment of the Parana River, organized according to the scientific structure of the National Institute of Limnology of Argentina (INALI-CONICET-UNL). It integrates contributions from specialists in physical geography, geomorphology, fluvial hydraulics, geochemistry and several branches of ecology: phytoplankton, macrophytes, zooplankton, benthos, littoral communities, fishes, amphibians, reptiles and birds. Such a diverse variety of approaches can hardly be synthesized by a unique word, although we authors believe that the classical term “limnology” still works.

The volume is organized into four sections. Part I contains the physical and chemical characteristics of the system and related regions. The first two chapters describe the physical geography of the river basin and the geomorphology of the floodplain. Chapter 1 describes the physical geography of the whole Paraná basin, with its geological and climatic components and location in

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South America; limnological connections with the Amazon basin are developed. Chapter 2 synthesizes the geomorphology of the floodplain called the Middle Paraná, which is characterized by several well-defined geomorphological units, each of them with a different ecological meaning. Chapter 3 develops a characterization of shape, size, and depth for more than 1,500 lakes inside the plain by using techniques of quantitative geomorphology. It is really important to know the main parameters of a “mean lake” in this region with thousands of water bodies. Chapter 4 describes the complex dynamics of water in selected lakes of the plain during floods and low waters, a mechanism that reverses in some epochs and varies among years. Chapter 5 details the sediment budget, which discriminates Andean sources from other geological terrains and the main channel–floodplain interrelationships over decades. A comprehensive study of the geochemistry of the Paraná River and related systems is presented in Chap. 6, considering the influence of El Niño years as well as other factors.

Parts II and III address aquatic communities of vegetables and invertebrates related to the lentic and lotic environments of the floodplain and the main channel of the studied complex of ecosystems. Each chapter includes a synthetic description of the composition and abundance of these communities as well as an analysis of their functional and distributional variations in relation to the dominant environmental factors, meaning those directly or indirectly associated with the flood pulse. All these chapters deal with traditionally important conceptual areas of limnological knowledge but stress the particularities of these communities in a subtropical floodplain.

Chapter 7 is devoted to phytoplankton of the main channel and the alluvial plain and the spatiotemporal changes of this community associated to the hydrosedimentological regime. The essential role of the floodplain in maintaining algal populations and incorporating them towards or from the lotic environments is also analyzed.

The complex combination of lenitic and lotic environments with different conditions of flux and water quality located between the floodplain and the main channel were found to be closely associated with the composition, number of species, diversity, density, and biovolume of the assemblages inhabiting these environments. The more clear differences are shown during isolation periods.

In Chapter 8, the authors stress the important role of macrophytes, mainly *Eichhornia crassipes* and *Paspalum repens* due to their contribution to the productivity and to the physical structure of the system as habitat and refuge for a number of organisms. The importance of drifting vegetation as a dispersal mean and the distribution of nutrients is also discussed.

Chapter 9 details the realm of zooplankton and concludes that the assemblages of lotic environments of the Paraná River show characteristics similar to most other rivers of the world such as the dominance of small organisms and the low density, which is comparable to other South American rivers. The influence of the flood pulse on zooplankton of floodplain lakes is related to their degree of connection to a river. Between lotic and lentic environments

there are at least two gradients in regard to diversity and abundance of zooplankton, one of them associated to the relative influence of the physical and biological control and the other related to the level of environmental heterogeneity. In the main channel, biological mechanisms to control zooplankton populations would be less important than physical mechanisms of control.

The composition and abundance of benthic invertebrates of the Middle Paraná River floodplain complex, which is a mosaic of habitats undergoing succession, is described and discussed in Chap. 10. Environmental factors, which mainly control benthic structure and composition, are flood pulses, groundwater seepage, hydraulic parameters, hydrological connectivity degree, macrophyte cover, and water quality. In spite the great amount of organic matter accumulated on the bottom of floodplain environments, the “gathering-collectors” functional group is dominant, being the “shredders” present only in the floodplain. In the central strip of the higher channels, the assemblages are characterized by the dominance of species endemic to the Neotropical region, mainly *Narapa bonettoi*.

The littoral communities of floodplain environments of the Middle Paraná River are then treated in Chap. 11, which include a group of complexes of high biological diversity and abundant populations. Macrocrustaceans constitute an important group and have active participation in the community structure and biomass. Dominant species of this group are prawns of the genera *Macrobrachium*, *Palaemonetes*, and crabs belonging to the family Trichodactylidae. Biological and ecological aspects are then discussed, particularly growth, reproduction, spatial distribution, and trophic ecology. Co-adaptation of the assemblages of macrocrustaceans are also analyzed under the functional context imposed in the Paraná River from its formation, habitat characteristics, and stability degree, these factors being the product of a joint organic evolution.

Part IV addresses vertebrate animal life. Chapter 12 shows the high fish diversity and productivity in this section of the Paraná River and summarizes information about migratory displacements, reproductive strategies and life histories, participation of the fish species in the complex trophic webs, and data of metabolism and responses to hypoxia.

The objective of Chapter 13 is to present information about the diversity and natural history (tadpole and adult characteristics, habitat use, and reproductive traits) of anurans commonly found in riparian areas of the Middle Paraná River. The factors that determine the presence of anuran species in ponds are part of a complex network of relationships that act synergically.

Chapter 14 then analyzes the reptile community living in the floodplain, including aspects of species richness, ecological traits, and environmental variables. A total of 71 reptile species were recorded in the Middle Paraná River with snakes being the richest reptile group with 49 taxa, and they were found to occupy all type of habitats and substrates, including various species adapted to live in the water.

In conclusion, Chap. 15 presents data on the ecology of birds in the middle section of the river in relation to trophic and functional groups, seasonal dynamics, and characteristics of reproductive biology.

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